Chapter 14

Measuring Amount

↳ Mol concept with compounds

- 1 mol = 6.022×10^{23} "particles"
- Molar Mass = Mass on periodic table

↳ 14.5g Al = ___ mol Al = ___ Atoms Al

↳ $14.5\,g\,Al \times \frac{1\ mol\ Al}{26.98\ g\ Al}$ ← To / From Bottom

↳ 0.537 mols Al

↳ $0.537\ mols\ Al \times \frac{6.022 \times 10^{23}\ Atoms\ Al}{1\ mols\ Al}$

↳ 3.23×10^{23} Atoms Al

↳ Mass $\overset{mass}{\longleftrightarrow}$ Mol $\overset{Avogadro}{\longleftrightarrow}$ particles (atoms, molecules, formula units)

↳ For elements → 1 mol = 6.022×10^{23} atoms

↳ For compounds (covalent) → 1 mol = 6.022×10^{23} molecules

(ionic) → 1 mol = 6.022×10^{23} formula units

↳ Molar Mass = Total of each element.

↳ ex: $NaCl$ → $23.0_g + 35.5_g$ → $58.5\,g/mol$

$CaSO_4$ → $40.1 + 32.1 + (16 \times 4)$ → $136.2\,g/mol$

ex: $17.2\,g\,NaCl \times \frac{1\ mol\ NaCl}{58.5\ g\ NaCl}$

0.294 mol NaCl

Ca = 40.08
S = 32.06
O_4 = 64
136.14g

ex: $35.5\,mol\ CaSO_4 = \frac{?}{136.14\ g\ CaSO_4}\ g\ CaSO_4$

$35.5\,mol\ CaSO_4 \times \frac{136.14\ g\ CaSO_4}{1\ mol\ CaSO_4}$

4832.9 g $CaSO_4$

C_4 = 48.04
H_{10} = 10.08
58.12

ex: $1.53 \times 10^{24}\ molec\ C_4H_{10} = \frac{?}{1\ mol\ C_4H_{10}}\ mol\ C_4H_{10}$

$1.53 \times 10^{24}\ molec\ C_4H_{10} \times \frac{1\ mol\ C_4H_{10}}{6.022 \times 10^{23}\ molec\ C_4H_{10}}$

2.54 mol C_4H_{10}

C = 12.01
O_2 = 32
44.01

ex: $12.6\,g\,CO_2 = \frac{?}{1\ molec\ CO_2}\ molec\ CO_2$

$12.6\,g\,CO_2 \times \frac{1\ mol}{44.01} = 0.286\,mol\ CO_2$

$0.286\,mol\ CO_2 \times \frac{6.022 \times 10^{23}\ molec\ CO_2}{1\ mol}$

1.72×10^{23}

% Composition By Mass

↳ $^{2g}H_2O^{16}$

↳ % H = 11.1%

Mass of H_2 → $\frac{2gH}{18g} = 11.1\%$

Total Mass →

↳ % Comp = $\frac{\text{Total mass of the element in the compound}}{\text{mass of compound}} \times 100\%$

↳ % O in $CaCO_3$ (40.1, 12, 48)

$\frac{48gO}{100.1g} \times 100\% = 48\%\ O$

↳ % N in $(NH_4)_3PO_4$

$\frac{42gN}{149g} \times 100\% = 28.18\%$

Law of Definite Composition

↳ All samples of an element or compound will have same chemical make up regardless of source or size of sample.